(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 July 2003 (31.07.2003)

PCT

(10) International Publication Number
WO 03/062666 A1

(51) International Patent Classification[7]: F16G 5/20

(21) International Application Number: PCT/US03/01238

(22) International Filing Date: 13 January 2003 (13.01.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/349,795 16 January 2002 (16.01.2002) US

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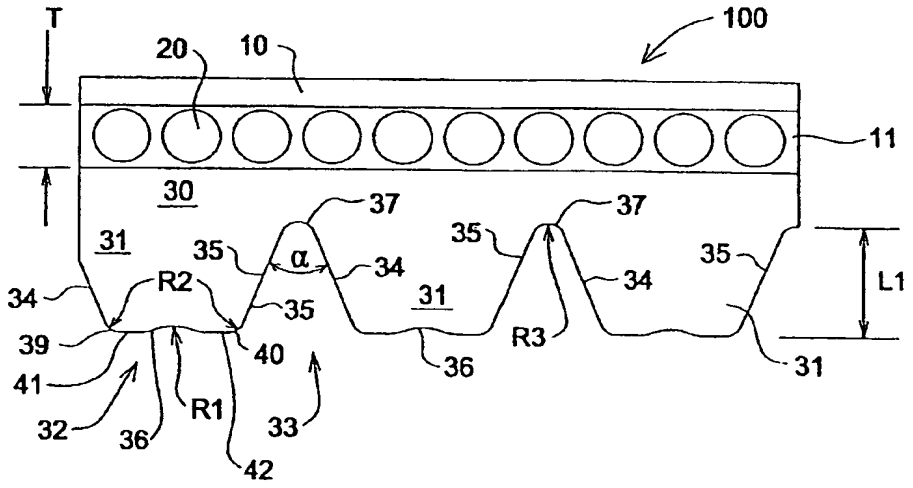
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: MULTI-RIBBED BELT WITH TIP PROFILE



(57) Abstract: The invention comprises a multi-ribbed belt (100) wherein rib tip (32) has a concave arcuate surface (36) disposed between substantially flat surfaces (41,42), which are in turn disposed between rib side surfaces (34,35). The substantially flat surfaces are adjacent to curved surfaces (39,40), which connect to rib side surfaces (34,35). The inventive rib profile and rib compound construction significantly reduce rib tip cracking, which significantly reduces belt flex fatigue under high applied frictional torque. Further, the inventive rib profile and rib compound construction significantly reduces high localized tensile stress/strain at the rib tip and highly localized shear stress at the rib flank, thereby significantly reducing rib tip cracking and rib tear off. The inventive belt also comprises a significantly reduced contact normal force, thereby increasing an operating life of the belt.

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What is needed is a multi-ribbed belt having improved belt flex fatigue. What is needed is a multi-ribbed belt having improved flex fatigue under a high frictional torque. What is needed is a multi-ribbed belt having a rib tip profile to minimize rib tip cracking. What is needed is a multi-ribbed belt having a rib tip profile to minimize rib/pulley interface contact deformation. What is needed is a multi-ribbed belt having a rib tip comprising a concave surface disposed on a flat surface between rib side surfaces. What is needed is a multi-ribbed belt having a reduced contact normal force. The present invention meets these needs.

Summary of the Invention

The primary aspect of the invention is to provide a multi-ribbed belt having improved belt flex fatigue.

Another aspect of the invention is to provide a multi-ribbed belt having improved flex fatigue under a high frictional torque.

Another aspect of the invention is to provide a multi-ribbed belt having a rib tip profile to minimize rib tip cracking.

Another aspect of the invention is to provide a multi-ribbed belt having a rib tip profile to minimize rib/pulley interface contact deformation.

Another aspect of the invention is to provide a multi-ribbed belt having a rib tip comprising a concave surface disposed on a flat surface between rib side surfaces.

Another aspect of the invention is to provide a multi-ribbed belt having a reduced contact normal force.

Fig. 4 is a cross-section of the inventive belt showing a contact normal force.

Detailed Description of the Preferred Embodiment

Fig. 1 is a plan end view of the inventive belt. The disclosed rib tip profile and rib construction minimizes rib tip cracking and rib/pulley interface contact deformation, and thus enhances belt flex fatigue strength in high torque applications. The inventive belt engages two or more grooved pulleys. A torque is transmitted from a driver pulley to a driven pulley by a frictional contact between a belt ribbed surface and a pulley grooved surface.

The inventive belt 100 comprises overcord layer 10, tensile cords 20, undercord 30, and ribs 31.

Nylon short fiber reinforced fabric is used for the overcord layer 10. Other fabrics which may be used for overcord layer 10 include nylon and polyester woven fabric. An overcord thickness is in the range of approximately 0.40mm to 0.55mm.

Tensile cords 20 may comprise a high modulus cord, such as aramid cords having a cord diameter of approximately 0.65mm to 0.80mm and cord spacing of approximately 22~26 epi. Cords 20 are embedded in an adhesion gum 11 having a Young's modulus in the range of approximately 40 to 60Mpa. Cords 20 may also comprise polyester cord having a cord diameter in the range of approximately 0.85 to 0.94mm and cord spacing in the range of approximately 20 to 22 epi. Cords 20 are embedded in an adhesion gum 11 with Young's modulus in the range of approximately 25 to 40Mpa. Other tensile cord materials also include aramid, polyester, nylon 4.6 or nylon 6.6 and

Curved surfaces 39 and 40 each describe a radius R2. Surfaces 39, 40 join substantially flat surfaces 41, 42 to rib flanks 34, 35 respectively. R2 is in the range of approximately 0.20mm to 0.75mm.

Curved surface 37 having radius R3 joins adjacent rib flanks 34, 35. Surface 37 has a radius in the range of approximately 0.15mm to 0.45mm.

The inventive rib profile and rib compound construction significantly reduce rib tip cracking, which significantly reduces belt flex fatigue under high applied frictional torque. The compound comprises:

Composition	Weight Parts
Polymer (Rubber)	100
Carbon black	5~30
Short Fiber (1~6mm)	3~8
Silica	30~60
Oil	10
AOX	1
CoAgent	15
Cure	6

Further, the inventive rib profile and rib compound construction significantly reduces high localized tensile stress/strain at the rib tip and highly localized shear stress at the rib flank, thereby significantly reducing rib tip cracking and rib tear off. The smooth curved surfaces 39, 40 minimize concentrated contact deformation due to rib wedging into a pulley groove.

Fig. 2 is a graph showing a reduced rib tip tensile stress/strain for the inventive rib. In the inventive rib construction, the rib tip surface 36 contributes to minimize a rib tip high tensile stress/strain during back bending on a flat pulley. The smooth curved surfaces 39,

Claims

I claim:

1. A belt comprising:
an elastomeric body having a tensile member embedded therein and a pulley engaging surface;
the pulley engaging surface having a rib extending in a longitudinal direction;
the rib having a tip describing a concave surface disposed between substantially flat surfaces.

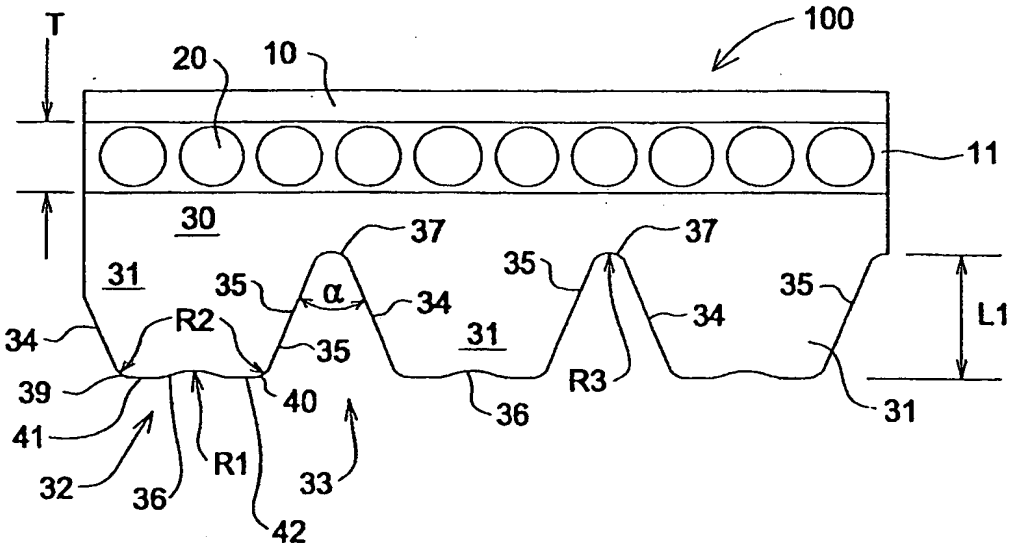
2. The belt as in claim 1 wherein the concave surface further comprises an arcuate surface.

3. The belt as in claim 2 further comprising;
a first curved surface and a second curved surface on either side of the substantially flat surfaces, each joining the concave surface to a rib flank.

4. The belt as in claim 3 further comprising:
a third curved surface joining adjacent rib flanks; and
an angle between adjacent rib flanks in the range of approximately 34° to 46°.

5. The belt as in claim 3, wherein the first curved surface and the second curved surface each have substantially equal radii.

6. The belt as in claim 3 further comprising an overcord disposed opposite a rib relative to the tensile member.


T
20
10
100
11
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37
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L1
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R2
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31
39
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R3
36
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41
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36
R1
33
42

FIG.1

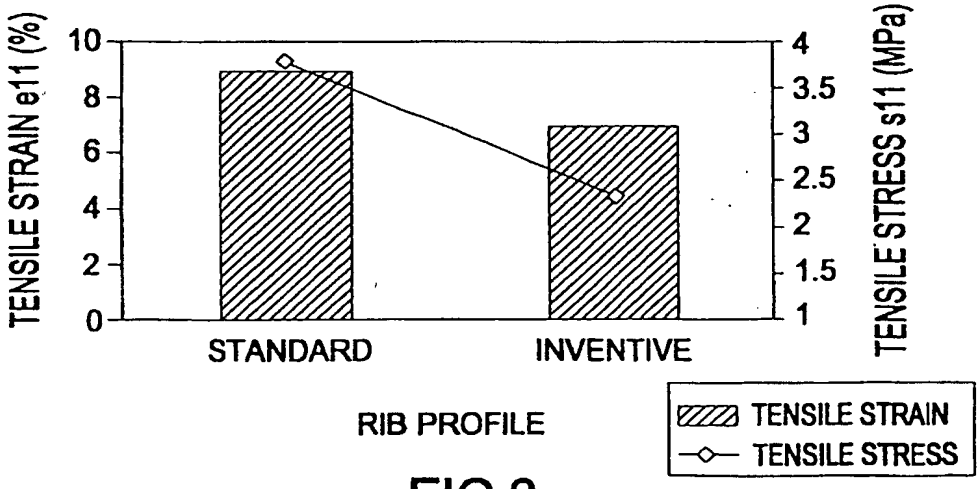
TENSILE STRAIN e11 (%)
10
8
6
4
2
0
4
3.5
3
2.5
2
1.5
1
TENSILE STRESS s11 (MPa)
STANDARD
INVENTIVE
RIB PROFILE
TENSILE STRAIN
TENSILE STRESS

FIG.2

INTERNATIONAL SEARCH REPORT

Inte Application No
PCT/US 03/01238

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F16G5/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 F16G B29D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
PAJ, WPI Data, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 4 944 717 A (GEORGET PIERRE) 31 July 1990 (1990-07-31) cited in the application the whole document	1
A	US 5 492 507 A (KUMAZAKI TOSHIMI) 20 February 1996 (1996-02-20) cited in the application the whole document	1
A	US 2 054 619 A (FREEDLANDER ABRAHAM L) 15 September 1936 (1936-09-15) page 2, right-hand column, line 44 - line 49; figure 18	1

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 May 2003	14/05/2003

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Inter Application No
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